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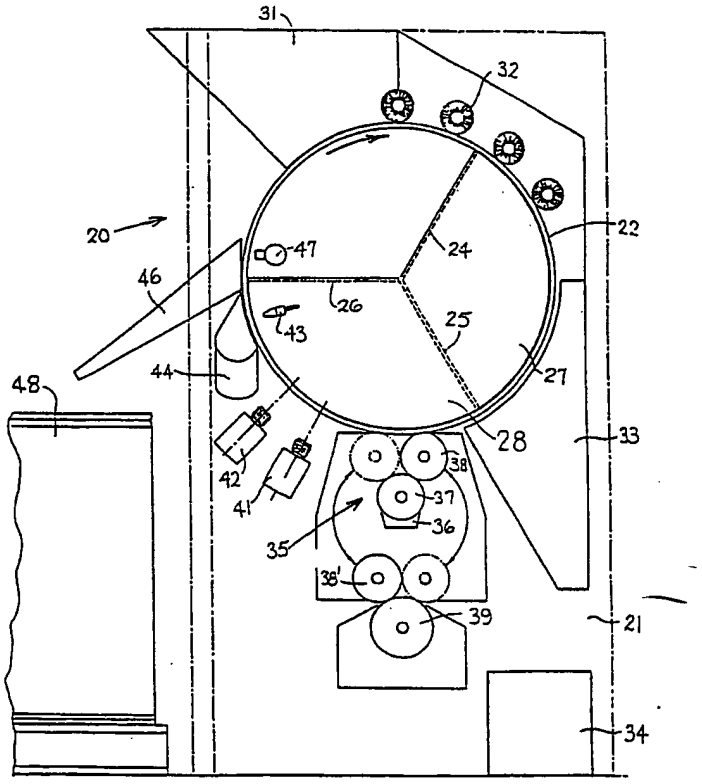
(54) Title: COMBINED INK LASER PRINTING OF TABLETS

(57) Abstract

A process and apparatus for branding tablets, including a feeder (22) defining a row of recesses (23) each being adapted to accommodate a tablet. The feeder (22) moves individual tablets into a first station whereat an offset printing device (35) prints a graphic ink symbol or geometric ink shape on an exposed face of the tablet. The feeder then moves the tablet to a second station whereat a laser marking system (41) removes portions of the offset printed ink to expose the tablet material therebeneath.



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COMBINED INK LASER PRINTING OF TABLETS

FIELD OF THE INVENTION

This invention relates to a process and apparatus for branding tablets, specifically pharmaceutical tablets, which process and apparatus preferably includes a feeder which initially moves individual tablets into a first station wherein an offset printing device prints a graphic symbol or geometric shape on an exposed face of the tablet, whereupon the feeder then moves the tablet to a second station whereat a laser marking system removes portions of the offset printed ink to expose the tablet coating therebeneath.

BACKGROUND OF THE INVENTION

Tablets, particularly pharmaceutical tablets, conventionally have trademarks (such as names or symbols) or company names printed thereon, such conventionally being referred to as "branding" of the tablets. This printing on or "branding" of tablets is conventionally done by tablet printing machines which are based on conventional offset printing technologies. These machines pick up and retain tablets in machine cavities. A rubber print roll then picks up ink from an engraved "design" roll and places it on the tablets.

U.S. Patent No. 4 672 892 (Ackley) illustrates a conventional tablet printing apparatus wherein tablets within a hopper are positioned into recesses formed in a drum periphery, which recesses have suction applied thereto to hold the tablets therein. The tablets are then moved past a first ink printer to print on one side face of the tablets, whereupon the tablets are then transferred to a chain conveyor and moved under a second printer to print on the other side face of the tablets.

U.S. Patent No. 3 889 591 (Noguchio) illustrates another known tablet printing arrangement similar to that of Ackley described above. More specifically, Noguchio supplies tablets from a hopper to drum recesses, with the tablets being positioned and held by a vacuum. The drum moves the tablets past a first ink printer which prints on one side of the tablets, and then transfers the tablets to a second drum which moves them past a second ink printer which prints on the other side of the tablets.

U.S. Patent No. 4 619 196 (Matsuoka) discloses a tablet printer wherein tablets from a hopper are positioned in drum recesses which connect to a vacuum, with the tablets being moved past a conventional ink roller to print on one side of the tablet.

U.S. Patent No. 2 859 689 (Ackley) discloses a conventional arrangement wherein tablets are transferred from a hopper to recesses in a rotary drum, and are then transferred to a chain conveyor which moves the tablets under the ink-printing roller.

U.S. Patent No. 3 802 340 (Braum) illustrates a device which involves a rotary drum having recesses for the tablets, with ink rollers being disposed both inside and outside the drum to permit printing on both sides of the tablets.

U.S. Patent No. 3 106 166 (Sawtelle) discloses a device involving a sloped rotary table for feeding tablets past an ink roller.

U.S. Patent No. 4 254 704 (Ackley et al) illustrates a drum-type arrangement which feeds capsules to a secondary drum, the latter having a vacuum applied to the recesses for holding the capsules therein. The second drum transfers the capsules to a standard chain conveyor which feeds the capsules under an ink-printing roller.

With respect to conventional tablet printing machines, such as machines of the aforementioned types, such machines generally have one or more of the following problems associated therewith.

In some of the known machines, the tablets are not securely or precisely held within the machine cavities, and in fact are often free to move. Hence, this often results in the printing being inaccurately positioned on the tablet.

Also, the print quality in conventional machines of the aforementioned types often is less than desired. The rubber print roll that transfers the ink onto the tablet often becomes dirty, resulting in smudged lettering. When this occurs, the operator must stop the machine and clean the rubber roll. In addition, the ink in the ink tray gradually gives up its solvents to the air over time, and the operator must periodically stop the machine to add solvent and stir the ink. This inconsistency in the viscosity of the ink can result in print that is smudged or print that is faded.

Another problem associated with some of the known machines is their inability to detect defective tablets. That is, these machines have no sorting system to keep broken or defective tablets out of the machine, and hence such tablets are passed through the machine and branded along with the good tablets.

Further, since the tablets in some of the machine cavities are free to "float", a tablet will occasionally bounce out of the cavity, and such tablet can then be crushed by the print roll, thereby creating a contamination problem.

Accordingly, it is an object of this invention to provide an improved tablet branding process and apparatus which overcomes many of the above disadvantages, and which permits branding of tablets at a high production rate while resulting in a "brand" of high quality on the tablet, with the brand being accurately positioned and of significant flexibility and desirability as regards appearance.

More specifically, the present invention relates to an improved tablet branding process which is basically a two-step process in that the first step prints a graphic symbol or geometric shape on the tablets surface using traditional offset printing technology, whereas the second step employs a laser marking system to remove portions of the offset printed ink to thus expose the tablet coating therebeneath. The areas of the tablet coating thus exposed form graphic symbols or alpha-numeric text within the offset printed area. This thus not only provides a brand or marking which is highly and uniformly visible, but also permits creation of much more distinctive and unique markings then would otherwise be possible using solely offset printing techniques.

The present invention also relates to an improved branding process, as aforesaid, wherein the tablets are preferably fed from a hopper into a series of recesses which are formed circumferentially around a feed drum, which drum rotates the tablets initially through alignment stations which ensure that the tablets are properly seated within the drum cavities, then rotates the tablets past a printing

station whereby a graphic symbol or geometric shape is ink printed onto the tablet surface. The drum then rotates the tablets past a marking station whereby a laser acts through an appropriate mask to remove selected portions of the printed ink to thereby expose the underlying tablet coating which is of a significant color difference from the printed ink to thereby create a distinctive marking (such as a name or symbol) within the offset printed area. The drum then rotates the tablets past an inspection station and past a reject station which ejects defective tablets from the drum, and then rotates the tablets to an ejection station for removal from the drum.

The present invention also relates to an improved machine or apparatus for branding of tablets according to the two-step process explained above. The machine preferably includes a single rotatable drum having a series of cavities or recesses thereon, which cavities are preferably connected to a suction source so as to securely retain tablets within the individual cavities. An ink-printing apparatus, including an ink-printing roller, is disposed at a first station circumferentially around the drum to permit ink printing of a selected shape or symbol onto the tablet surface. A conventional laser marking system is disposed at a second station adjacent the drum which is rotationally located downstream from the ink-printing device. This laser marking device effects selected removal of the ink printed area to hence form a symbol or lettering or numbers within the ink printed area. Inspecting and tablet rejecting devices are located adjacent the drum periphery in the rotational downstream direction from the laser marking system. The complete two-step printing or marking operation, including feeding

and discharging of tablets to and from the drum, can be accomplished on a single drum during a single rotation thereof.

Other objects and purposes of the present invention will be apparent to persons familiar with processes and equipment of this general type upon reading the following specification and inspecting the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic side elevational view illustrating a tablet branding machine of this invention.

Figure 2 is an enlarged, fragmentary sectional view illustrating the perimeter of the drum and the tablet-receiving recesses therein.

Figure 3 illustrates a tablet with a brand thereon as formed according to the invention.

Certain terminology will be used in the following description for convenience in reference only, and will not be limiting. For example, the words "upwardly", "downwardly", "rightwardly" and "leftwardly" will refer to directions in the drawings to which reference is made. The words "inwardly" and "outwardly" will refer to directions toward and away from, respectively, the geometric center of the apparatus and designated parts thereof. Said terminology will include the words specifically mentioned, derivatives thereof, and words of similar import.

DETAILED DESCRIPTION

Referring to Figure 3, there is illustrated a sample tablet 10 which is branded using the two-step technique of the present invention. This branding is applied to one of the faces 11 of the tablet and includes a graphic symbol or geometric shape 12 which is applied to this face 11 by means of ink printing, such as by a conventional offset printing technique.

This geometric shape or graphic symbol 12, in the illustrated embodiment, comprises an elongate rectangle of a solid color corresponding to the ink color. Further, the ink is of a color which is significantly different from the surface color of the tablet so as to create a significant visual difference or contrast. Thereafter, by means of a laser printing step, portions of the ink coating defining the geometric shape 12 are removed, such as at the regions designated 13, so as to define a desired symbol and/or alphabetic and/or numeric characters. These removed ink surface areas 13 in the illustrated embodiment define the trademark "MOTRIN". These ink-removal areas 13 normally also slightly penetrate the surface of the tablet, but still retain an original tablet color to hence create a significant color difference and thus a significant visual contrast between the ink-removal areas 13 and the surrounding ink-defined geometric shape 12. Needless to say, the brand of Figure 3 is solely for explanation purposes, and numerous variations can be made therein both with respect to the graphic symbol or geometric shape 12, and the ink-removal areas 13.

Referencing now Figures 1 and 2, there is illustrated an apparatus 20 capable of effecting a two-step branding of tablets or capsule according to the present invention. This apparatus includes a frame 21 which is indicated only generally by dotted lines, and on which a tablet feed drum 22 is supported for rotation about a generally horizontal axis. This feed drum 22 defines in the outer perimeter or periphery thereof a series of circumferentially shaped small cavities 23 (Figure 2), each of which is adapted to at least partially accommodate a tablet 10 therein. These cavities 23 are uniformly angularly

spaced circumferentially around the drum so as to be disposed substantially within at least one circumferentially-extending row.

The drum 22 rotatably and sealingly cooperates with interior divider walls 24, 25 and 26 which are stationary and cooperate with the rotatable drum to define vacuum chambers 27 and 28 which cooperate with the drum over a selected arcuate extent thereof. These vacuum chambers 27 and 28 communicate with a conventional vacuum source (not shown) such as a vacuum pump. The chamber 27 is preferably maintained at a low vacuum, and the chamber 28 maintained at a higher vacuum, this being accomplished through suitable pressure-regulating controls. The peripheral drum wall has small vacuum-communicating passages 29 extending radially therethrough for communication with the bottom of each of the cavities 10, which passages 29 communicate with the vacuum chambers 27 and 28 when the respective recess 23 moves through this selective arcuate extent.

The feed drum 22 is supplied with conventional tablets at a first station, such supply in the illustrated embodiment being by means of a hopper 31 which communicates with the upper region of the drum 22 and has a lower discharge chute which is positioned so as to closely conform with the periphery of the drum to permit tablets to be deposited into the individual recesses 23. As the drum rotates (clockwise in Figure 1) away from the hopper, suitable alignment brushes 32 or similar devices can be provided adjacent the periphery of the drum to assist in aligning and properly seating the tablets within the respective recesses.

The tablet-containing recesses then pass into the arcuate region encompassed by the vacuum chamber 27, which vacuum communicates with the tablet-containing recesses 23 through the openings 29 to

assist in properly seating the tablets within the individual recesses. In the event that any of the tablets do not properly seat, and hence are not properly sucked against the bottom of the recess, then as the drum moves downwardly, these tablets fall into a collecting chute 33 which directs them into a suitable collecting receptacle 34. The tablets which are properly seated in the respective recesses, however, are held firmly therein due to the suction applied through the opening 29, and hence remain seated even as the tablet moves downwardly around the lower periphery of the drum.

At a station or location disposed downstream from the chute 33, there is provided an ink-printing means 35, the latter being disposed directly adjacent the periphery of the drum adjacent the lower part thereof. This ink-printing means comprises a generally conventional offset-type ink printer in that it includes an ink reservoir 36 for supplying ink onto a first roller 37, the latter being conventionally an engraved "design" roller. This roller 37 in turn transfer the ink to a rotatable rubber print roll 38. This latter roller 38 is supported for rotation about an axis generally parallel with the drum rotation axis, and has its printing periphery disposed directly adjacent the periphery of the drum so as to permit a graphic symbol or geometric shape (such as shape 12 in Figure 3) to be printed on the exposed face of the tablet.

The ink-printing means 35 in the illustrated embodiment includes two print rolls 38 and 38' mounted on a turret which can be alternately rotated between two positions so that either ink roll 38 or 38' can be disposed in the print position, and the other disposed for engagement with a cleaning roll 39. It will be appreciated, however, that any

conventional offset type printing roll arrangement, many of which are already conventional for printing of tablets, can be utilized.

After leaving the location of the printing means 35, the drum 22 carries the tablets downstream to an adjacent location whereat there is provided a laser marking system 41. This laser marking system 41 is disposed adjacent the periphery of the drum and cooperates in a conventional manner, such as through a suitable mask, for marking a tablet. This laser marking system 41 is capable of effecting removal of selected portions of the previously printed ink area, such as portions 13 illustrated by Figure 3, to thereby create either a symbol or some other selected alphabetic and/or numeric designation. To ensure that the selected ink areas are effectively removed, the laser is preferably adjusted to also effect partial removal of a very small depth of the underlying coating or surface material of the tablet, whereby the removed areas hence provide a very sharp and distinct contrast to the surrounding inked areas. Further, this laser marking system 41 enables creation of very sharp, distinct and complex shapes or configurations or letters, and hence provides a capability which is not possible using conventional tablet ink-printing techniques.

The laser marking system itself is a known arrangement which has primarily been used for creating labels and signs, and one example of such system is manufactured by Lumonics Marking Corporation.

As illustrated by Figure 1, the apparatus 20 also preferably includes a tablet inspection device 42 disposed adjacent the periphery of the drum at a location downstream of the laser marking system 41. The purpose of this inspection device 42 is to inspect the brand for accuracy, and to permit

rejection of all defective tablets. For this purpose, if the inspection device 42 locates a defective tablet, then it transmits an appropriate signal to an air jet 43 which is located downstream thereof whereby, with suitable timing, the air jet 43 is activated to apply pressure to the underside of the recess to effectively dislodge the defective tablet, which defective tablet is collected in a receptacle 44.

As is apparent from Figure 1, the printing means 35 and the laser marking system 41 both cooperate with the arcuate region of the drum which extends over the high vacuum chamber 28 so that the tablets are hence securely retained within the respective recesses.

After rejection of defective tablets, the remaining tablets are then rotatably carried by the drum out of the region which communicates with the high vacuum chamber 28, until the tablets are substantially aligned with a discharge chute 46. An air ejecting nozzle 47 is disposed interiorly of the drum so as to dislodge the branded tablets from the respective recesses, whereby the tablets then drop downwardly along the chute 46 for deposit into a collecting receptacle 48.

While the illustrated invention employs a drum whereby the tablet-supporting recesses move along an endless circular path, with the ink printing and laser marking stations being disposed at spaced locations along this path, it will be appreciated that other tablet feeding arrangements can also be provided for permitting the two-step branding technique of this invention to be carried out. For example, the tablet feed device may comprise an endless belt having tablet-receiving recesses spaced

therealong, whereby the belt hence defines an endless path having ink printing and laser marking stations disposed at spaced intervals therealong.

The operation of the improved two-step branding process of the present invention, and one form of an apparatus capable of carrying out the process, as illustrated by the drawings and as described above, is believed evident from the description set forth above.

Although a particular preferred embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed process and apparatus, including the rearrangement of parts, lie within the scope of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An apparatus for branding tablets, comprising:

rotatable drum means supported for rotation about a generally horizontal axis, said drum means having a row of tablet-receiving recesses formed therein and extending circumferentially around the perimeter thereof;

tablet-feeding means for feeding tablets into the recesses formed in said drum means at a first location adjacent the perimeter of said drum means;

ink-printing means for printing a graphic symbol or geometric shape onto the surface of the tablet as disposed within its respective recess when the tablet is disposed at a second location spaced circumferentially of said drum in the rotational direction from said first location;

laser means for removing portions of the printed ink on the tablet as held within the respective recess to expose the underlying tablet material when the tablet is at a third location which is spaced circumferentially from the second location in the direction of drum rotation; and

removal means cooperating with said drum at a fourth location spaced circumferentially from the third location in the direction of drum rotation for permitting removal of the tablets from the drum recesses, said fourth location being disposed circumferentially between said third and first locations.

2. An apparatus according to Claim 1, wherein said ink-printing means includes an ink roller supported adjacent the perimeter of the drum means

for printing contact with the tablet surfaces, said ink roller being disposed adjacent a lower portion of the drum means.

3. An apparatus according to Claim 2, including tablet inspection means disposed adjacent said drum means for inspecting the tablets at a fifth location which is spaced circumferentially from said third location in the direction of drum rotation, and ejection means cooperating with the drum at a sixth location which is spaced circumferentially from the fifth location in the direction of drum rotation for ejecting tablets which are sensed as being defective by said inspection means, said sixth location being disposed circumferentially between said fifth and fourth locations.

4. An apparatus according to Claim 2, wherein said drum means includes a plurality of suction passages formed therein, one of said suction passages communicating with each of said tablet-receiving recesses, and suction means communicating with selected suction passages which extend through a selected arcuate extent of the drum for applying suction to the tablets seated within the recesses which extend through said arcuate extent, said arcuate extent including said second and third locations but not said fourth location.

5. An apparatus according to Claim 4, including tablet inspection means disposed adjacent said drum means for inspecting the tablets at a fifth location which is spaced circumferentially from said third location in the direction of drum rotation, and ejection means cooperating with the drum at a sixth location which is spaced circumferentially from the fifth location in the direction of drum rotation for

ejecting tablets which are sensed as being defective by said inspection means, said sixth location being disposed circumferentially between said fifth and fourth locations, said fifth and sixth locations being within said arcuate extent.

6. An apparatus according to Claim 5, including means cooperating with the periphery of said drum at a seventh location located circumferentially ahead of said second location for collecting stray tablets which are not properly seated within the respective recesses.

7. A process for branding tablets, comprising the steps of:

providing a tablet having an exterior surface area of a determined color;

printing a graphic symbol or geometric shape on said surface area using printing ink of a color which is different from said first-mentioned color; and

removing predetermined portions of the printed ink defining the graphic symbol or geometric shape by means of a laser to expose the tablet coating therebeneath.

8. A process according to Claim 7, wherein said graphic symbol or geometric shape is applied to the tablet surface area by offset ink printing.

9. A process according to Claim 8, wherein the removing of predetermined portions creates graphic symbols or alphabetic or numeric text within the offset printed area.

10. An apparatus for branding tablets, comprising:

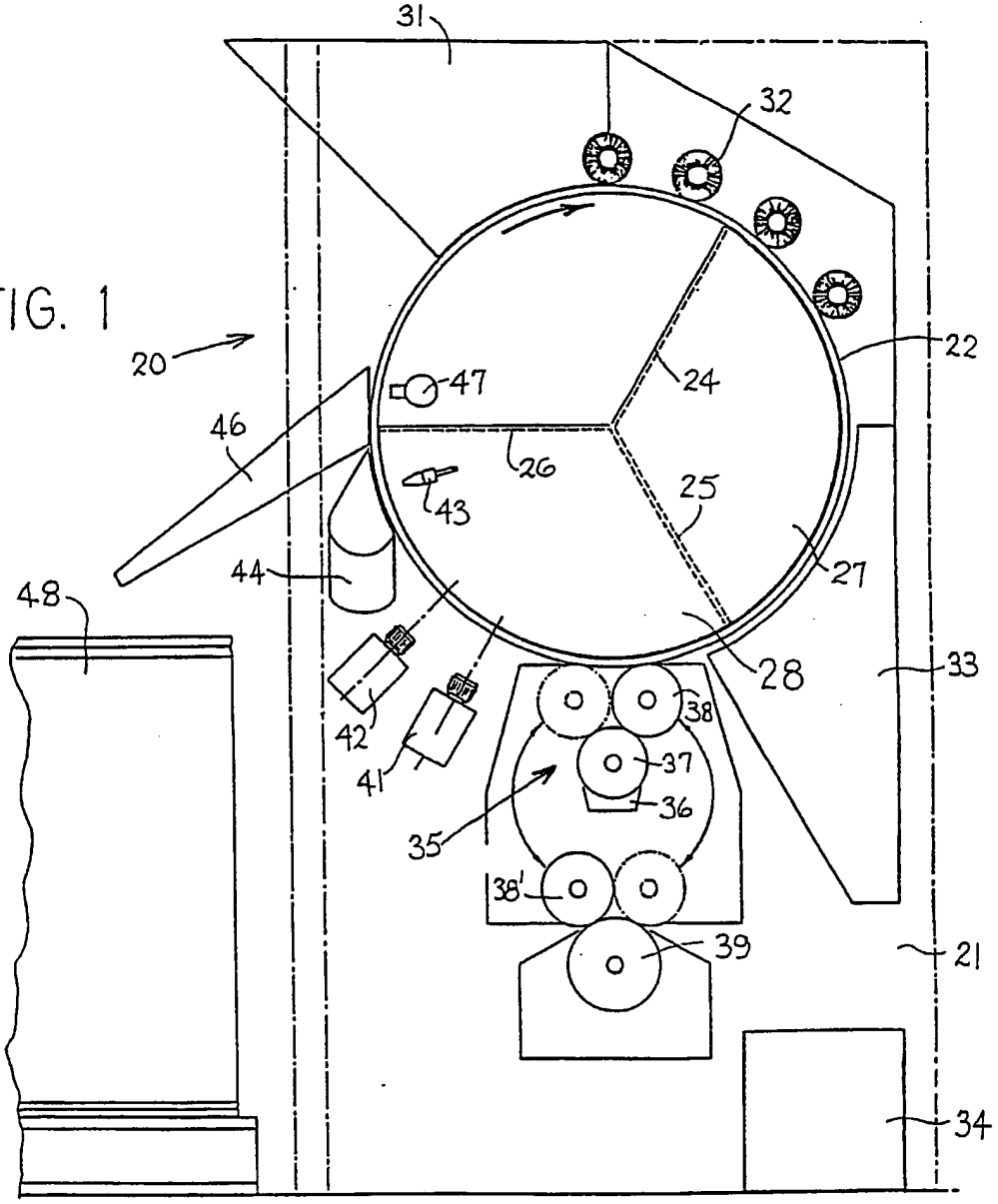
movable tablet-feeding means having a row of tablet-receiving recesses formed therein and extending generally around the perimeter thereof so as to define a generally endless loop-like path;

tablet-supply means for supplying tablets into the recesses formed in said feeding means at a first location along said path;

ink-printing means for printing a graphic ink symbol or geometric ink shape on the surface of the tablet as disposed within its respective recess when the tablet is disposed at a second location along said path which is spaced downstream of said first location; and

laser means for removing portions of the printed ink on the tablet as held within the respective recess to expose the underlying tablet material when the tablet is at a third location along said path which is spaced downstream from said second location.

FIG. 1



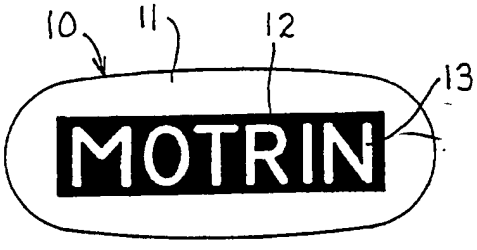


FIG. 3

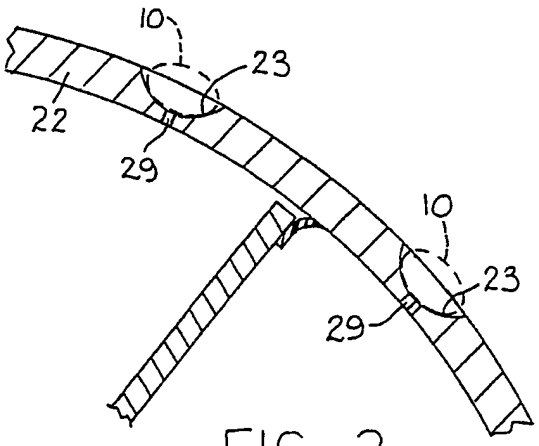


FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 90/04098

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: B 41 F 17/36

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	B 41 F; A 61 J; A 61 K

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	US, A, 4672892 (ACKLEY) 16 June 1987, see abstract; figure 2a	1-10
A	US, I4, T903014 (DEMPSKI) 3 October 1972, see the whole document	1-10
A	US, A, 4707711 (HUNTER) 17 November 1987, see column 1, line 1 - line 37	1-10

* Special categories of cited documents: [10]

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"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
6th November 1990	23. 11. 90
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	H. Ballesteros

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/US 90/04098

SA 39235

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on 27/09/90
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4672892	16/06/87	US-A- 4528904	16/07/85
US-I4- T903014	03/10/72	NONE	
US-A- 4707711	17/11/87	EP-A- 0246801	25/11/87
		JP-A- 62284744	10/12/87

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